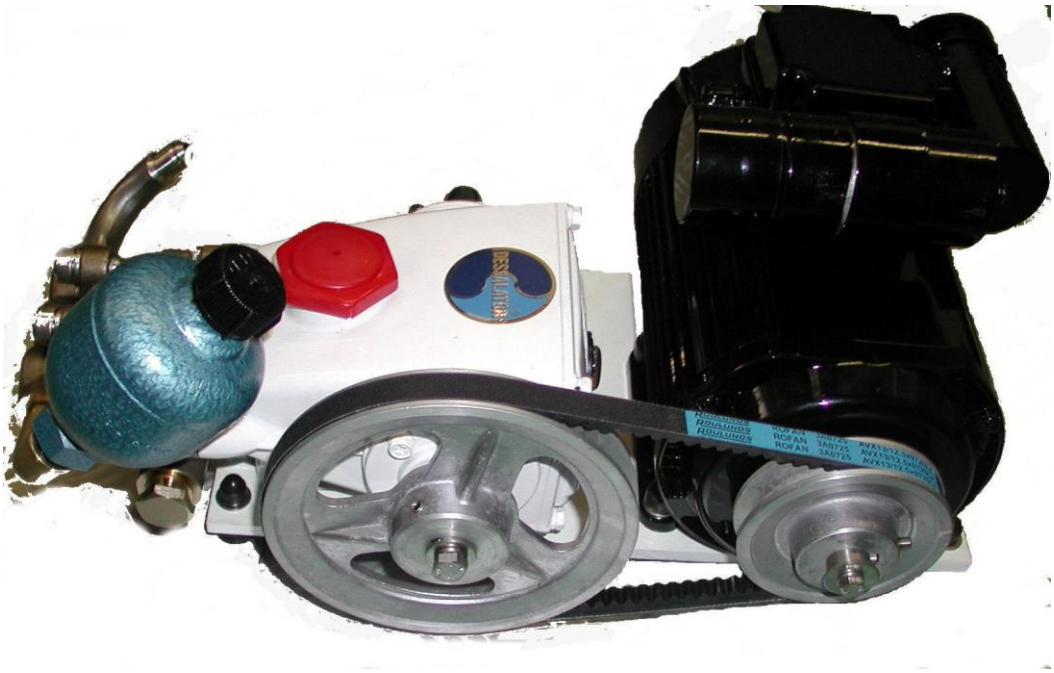
USER'S MANUAL
DESSALATOR® SOLO 100 LITRES / HOUR



DESSALATOR®

Technical and Sales Departments :
Z.I des 3 Moulins – "Euro 92 – Bât. D – rue des Cistes – 06600 ANTIBES

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: dessalator@wanadoo.fr
Web site: www.dessalator.com

Version A

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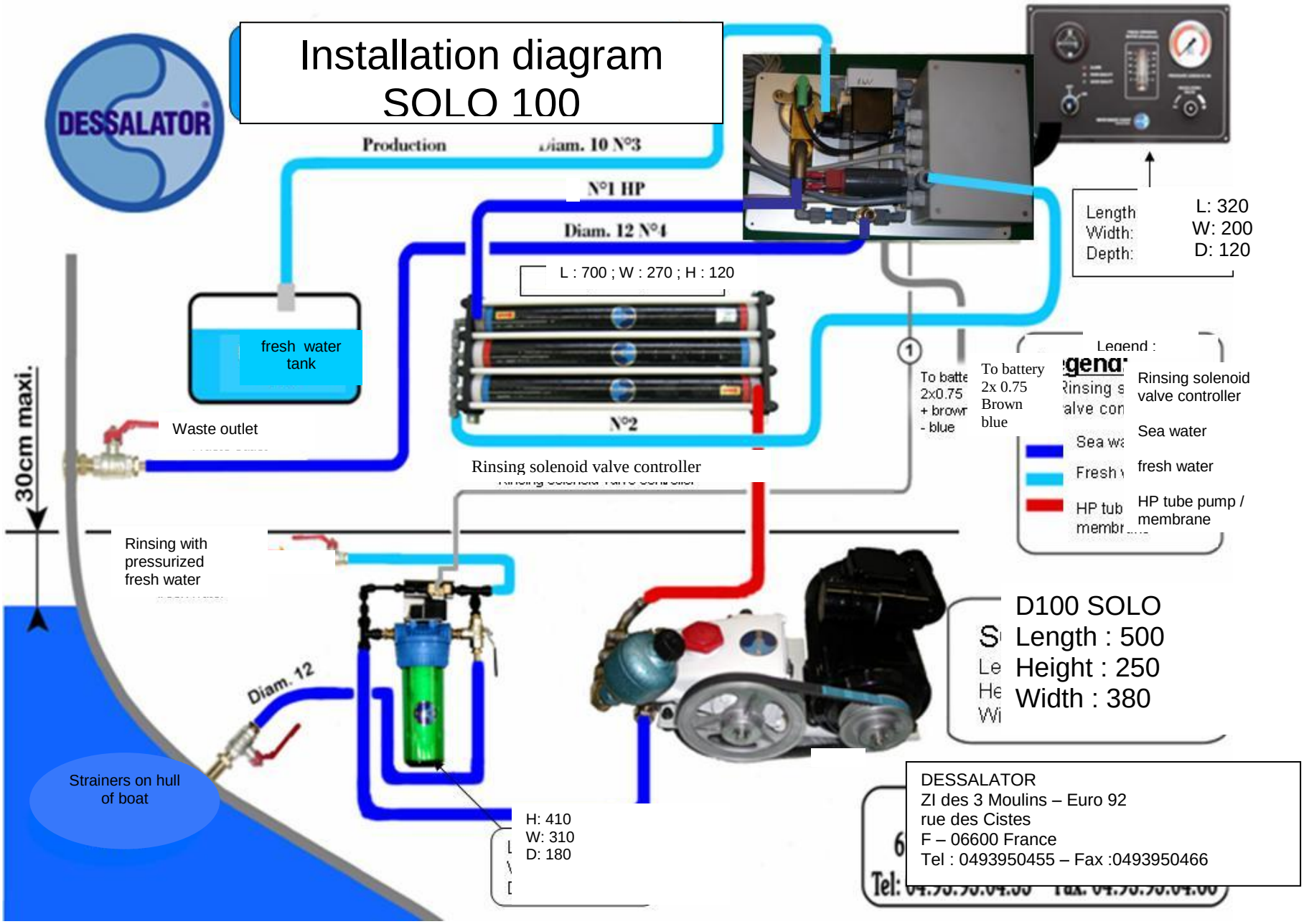
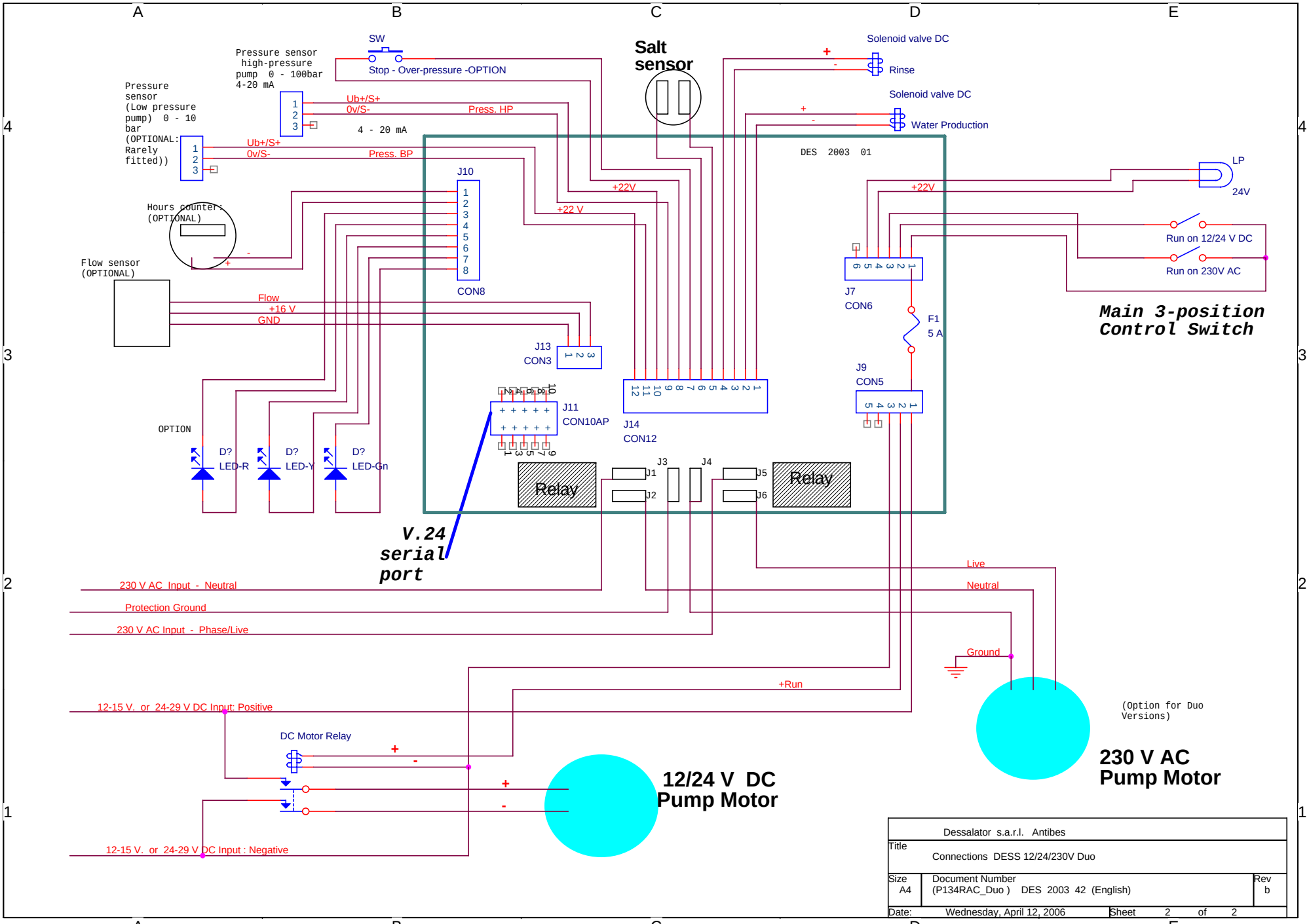


DESSALATOR
ZI des 3 Moulins – Euro 92
rue des Cistes
F – 06600 France
Tel : 0493950455 – Fax :0493950466



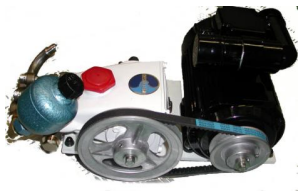
Dessalator s.a.r.l. Antibes		
Title: Connections DESS 12/24/230V Duo		
Size: A4	Document Number: (P134RAC_Duo) DES 2003 42 (English)	Rev: b
Date: Wednesday, April 12, 2006	Sheet 2 of 2	

1. Components supplied with the Dessalator®:

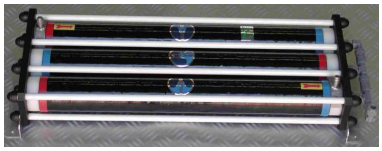
Version A

Hull valve:
The hull valve strainer filters out the larger particles at system entrance.

Pre-filter:
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench. For automatic rinsing an electro valve is mounted.



Motor-Pump unit:
The motor-pump unit is comprised of the 120, 230 or 400 V motor and a high pressure pump.



Membrane unit::
The membrane unit includes 3 membranes 2521 assembled in a compact frame.

According to the model, a fuse or a circuit breaker is supplied.

Control panel:
includes a HP gauge, a flowmeter, an on/off switch, a pressure adjustment knob, an operating time meter, 3 indicator lights and a control in 12 or 24 V for security.

Pipes and hoses supplied by Dessalator®:

- High pressure pipes pump/membranes and membranes/control panel (2 pipes and 4 special connectors)
- Water production pipe membrane / control panel.

Additional hardware needed for assembly:

- Miscellaneous screws (including Parker)
- Stainless jubilee clips ∅ 10 and ∅12
- Assortment of plastic rings (tie wraps)
- Teflon tape or insulating water proof tape
- Silicon Rubson mastic, Sicaflex or equivalent
- Ribbed insulating pipe for cables and HP tubes
- Tricoflex hoses ∅ 10 and ∅ 12
- Power cable: 35mm² for the 12V and 20mm² for the 24V
- Various tools (electric drill, saw, …)

2. How to install the watermaker:

2.1 Sea water inlet

Sea water inlet valve:

The strainer should be positioned as low as possible below the waterline and as far as possible from the deck waste oulet. Drill the hull ∅ 21mm. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. Please seal watertight with Rubson mastic or Sicaflex and ensure that the immersed part is painted with underwater grade paint.
The hull valve should be accessible for maintenance. Make the valve / strainer and valve / hose connector watertight using 577 Loctite or Teflon tape.

Cartridge pre-filter:

The pre-filter should also be positioned as low as possible below the waterline and it should remain accessible. The mounting bracket is reversible, which facilitates the height positioning. 5cm space should be left below the filter body to allow the filter basin to be removed. A wrench is supplied to dismantle the filter. Check that the O-ring seal for the basin is secure and that the bleeder screw is tightened. A three-way-valve which allows rinsing and sterilizing manually the system with pressurized fresh water is connected to the pre-filter. An electro valve is mounted on the outlet for automatic rinsing.

Connections:

Hull valve / three-way valve, Pre-filter / pump, Fresh water / three-way valve / rinsing electro valve
The sea water inlet valve should be connected to the pre-filter using a tricoflex hose of inner ∅ 12mm, for sea water circuit and rinsing under pressure. Mount two jubilee clips at each joint, with their tightening heads positioned diametrically opposite on the hose. Connect the pressurized fresh water from the water oulet to the three-way valve. This connection can be made under a sink, wash basin or anywhere on the length of the pressurized fresh water pipe. When operating in sea water mode, the valve handle should be positioned in line with the filter (see photo above).

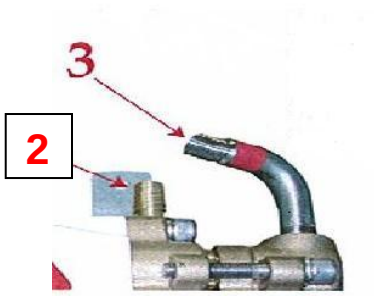
Recommendation:

If the pipe must pass through dividing walls or touch sharp edges, use an insulating pipe or tube superior to the pipe diameter to protect it against wear and friction.

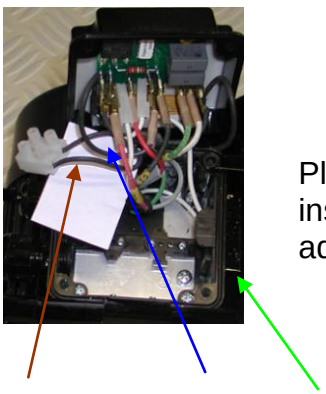
2. How to install the desalinator:

2.2 Motor unit:

The HP motor unit should be installed as low as possible in the boat in a horizontal position and it must be protected from water spray as much as possible. The unit is mounted using two alloy brackets under the two motors leaving a few centimetres clear space around the unit, to get sufficient air circulation space for motor cooling. The connection between the prefilter[1] oulet and the inlet to the low pressure side of the pump[2] is in Tricoflex hose of ∅ 12mm with doubled stainless jubilee clips at each joint.
The HP head of the pump is connected to the membrane inlet (red mark) through an HP pipe, cut to the appropriate length (see installation of connectors appendix A2).
Apply a little liquid Loctite or nut seal on the male and female cones before joining.



2.3 Electrical connections:

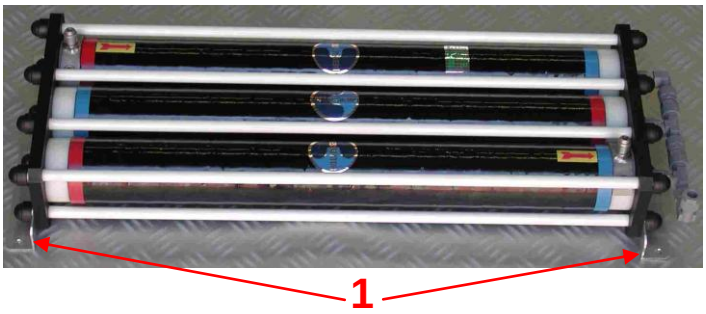


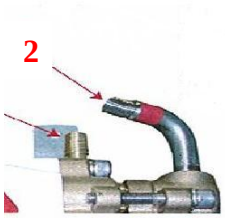
CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

Please connection the 120,230 or 400 V motor according to the installation diagram. Depending on the voltage, we supply an adequate circuit breaker.

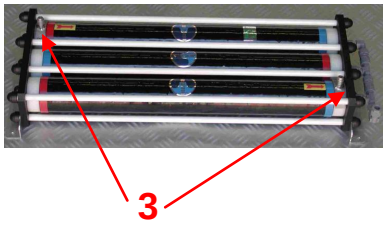
2. How to install the desalinator:

2.4 Membrane unit





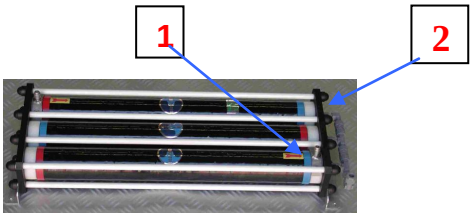
The membranes can be installed either vertically or horizontally. They are mounted using 4 Parker screws in *alloy brackets*[1]. As the hose from the HP pump[2] vibrates, it is preferable to install the hose with an insulating tube. The HP connectors should be installed strictly in accordance with the instructions (Appendix A2). Apply a little loctite or nut seal to the two male and female cones before tightening.

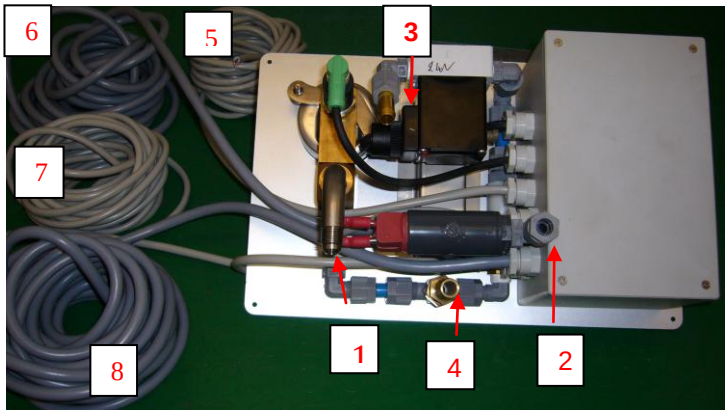


Recommendation: To facilitate the connection[3], it is possible to rotate the heads through 90° by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Remove the rod to obtain access and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the assembly.

2. How to install the desalinator:

2.5 Control panel:





The control panel must be mounted on a vertical surface as close as possible to the motor / pump unit and to the membranes. Leave space behind the panel to facilitate the connections. It is recommended that it is installed at the bottom or on the sides of cupboards, under chart table or main cabin seats, on the front panel of a rear bunk, …

The panel has the following water connections:

- HP pipe exiting the membranes (blue mark)[1]
- Production hose exiting the membranes (blue hose)[2]
- Production hose from panel to tanks[3]: a 10mm inner ∅ Tricoflex hose will be required which must be connected either to the fresh water tanks or to the distribution manifold on the fresh water unit inlet provided there is no constricting valve on the fresh water tank outlet.
- A Tricoflex waste oulet inner ∅ 12mm hose[4] will also be required which can be connected to a sink, wash basin or cockpit water drain, to avoid having the hull re-drilled. If this is not possible, remember to open the outlet valves before using the Dessalator.

Electrical connection:

- The cable[5] is for the solenoid valve connection, the cable[6] is connected to 230 volts, the cable[7] must be powered in 12 or 24 V on board network (brown:positive connection, blue: negative connection), the cable[8] is connected to the motor.

3. Starting the Dessalator®:

1. Ensure the valves are open before starting up the desalinator (Hull valve and waste oulet valve if relevant)

2. If the desalinator has not been run for several days rinse with the three-way valve on the pre-filter as for normal rinsing before use. This should be carried out while the desalinator is idle and with the pressure regulator open (fully anti-clockwise). Rinse for two minutes.

3. To start the desalinator, the pressure regulator must be open. Switch on.

4. Turn the pressure regulator dial to the right, until the HP gauge reading is in the orange zone then gradually adjust until the needle reaches the beginning of the green zone. Check that the pressure remains constant. The purpose of this operation is to remove air from the system and to obtain a more constant pressure while the desalinator is running.

5. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

6. If pressure becomes too high the desalinator will cut out and the red indicator will light up. If this occurs, reduce pressure, switch off and restart the desalinator.

7. To shut down the desalinator, reduce pressure. The rinsing electro valve will be activated for two minutes. Then switch off and stop the machine. If you use your water maker every two or three days and you do not wish to lose fresh water, just switch off before reducing pressure: the rinsing operation will not be done. N.B.: please do not forget to reduce then the pressure.

8. If the desalinator is not used for extended periods of time it should be rinsed preferably once a month. If not, the membranes will have to be sterilized before use.

Note: Fresh water production depends on the temperature of the sea water and on the cleanness of the 5µm pre-filter.

4. Directions for use:

MEMBRANES DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the reverse osmosis system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid either sea water before treatment, fresh water provisionally stored or sterilizing liquid if the desalinator is not used for extended periods of time (See sterilization methods appendix A3). Sterilizer is effective for six months and must be replaced after this period of time.

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea), which can clog the pre-filter and damage the membranes. However, if the desalinator has to be used in such conditions only run it for very short periods, as soon as clean sea water becomes available clean the membranes and run the system without pressure for 30 minutes with the pressure regulator open.

5. Maintenance:

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE.

5.1. Maintaining the membranes

5.1.1 CLEANING THE MEMBRANES:

When should the membranes be cleaned? After 800 working hours

Under normal conditions, the membranes may be contaminated by mineral residues or biological matter. These residues reduce both the volume of drinking water produced and the amount of salt filtered out. The membranes should be cleaned whenever the volume of water produced is 10 to 15% lower than the initial volume. This volume comparison can be made over the first 24 to 48 hours of operation, or when the detector indicates low quality after the probe has been cleaned. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membranes, then the membranes have to be replaced. Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membranes need to be replaced.

Membrane cleaning procedure:

1. Open the regulator valve fully (turning anti-clockwise).
2. Close the inlet and outlet hull valves.
3. Disconnect the inlet and outlet hoses and place them in a bucket containing 10 litres of fresh water and cleaning solution.
4. Run the desalinator without pressure for 10 minutes and then switch off.
5. Repeat three times, then rinse with fresh water for at least 15 minutes.
6. Reconnect the hoses.

5. Maintenance:

5.1.2 STERILIZING THE MEMBRANES

When should the membranes be sterilized?

Normally, regular monthly rinsing of the membranes may be all that is required to maintain the membranes. If this is not possible, sterilization will be necessary. A sterilisation procedure should be carried out every six months.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes, using the three-way valve on the pre-filter. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed, the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the watermaker inlet, at a spray pressure of 3 to 4 bars. If not; see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given in appendix A3. Before using the desalinator again simply rinse with fresh water for a few minutes using the three-way valve on the pre-filter and all traces of the sterilizer will be removed.

5.2. HP Pump

The HP pump is half filled with oil to the indicated level. Normally no additional oil is needed throughout the life of the watermaker. However, if refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level.

6. SPARE PARTS AND ACCESSORIES

Spare parts

Dessalator® systems are very reliable, hardwaring and do not generally require expensive services. Nevertheless an accident is always possible (running without enough water, accidental overpressure, impact,…).

Should the need arise, we supply spare parts and maintenance accessories:

- 5µm 10 ft filter
- driving belt
- motor relays
- production solenoid valve
- HP pump seals and valves
- HP hose (sold by meter)
- Connector for HP tube
- Flowmeter tube

Accessories:

- Sterilizing cartridge ST2
- Sterilizer bag
- Mineralizing cartridge

APPENDIX – A1

REVERSE OSMOSIS

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membrane. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membrane. This guarantees drinking water with a TDS value of 500. Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with chlorine or iodine and it should be also mineralized to ensure it remains consumable. Pay attention not to allow chlorine into the desalination system, as this could damage the device.

How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed through the 5 µm pre-filter. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurised water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. The production capacity of fresh water is achieved with a sea water temperature of 25°C. The output drops by approximately 2,5 to 5% for each degree below 25°C.

APPENDIX – A2

Installation instructions – HP Connectors

1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.

2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.

3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)

4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.

5. IMPORTANT: Check carefully that the end-piece does not block the hose:

   - either by blowing into the hose
   - or by inserting a screwdriver to check free passage.

APPENDIX – A3

Sterilizing cartridge – instructions for use

The desalinator is not running:

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Dismantle the basin of the pre filter
9. Remove the 5µm cartridge from the pre-filter.

Remove the 5µm cartridge from the pre-filter

9. Replace with the sterilizing cartridge ST2

Replace the 5µm cartridge with the sterilizing cartridge ST2

10. Set the rinsing valve to pressurized fresh water and rinse until all traces of the sterilizer have been removed.
11. At this point, the desalinator must be switched off
12. The sterilisation remains effective for six months at most. (Repeat after this time as necessary).

Caution: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes and ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

BEWARE: The ST2 cartridge is reusable.

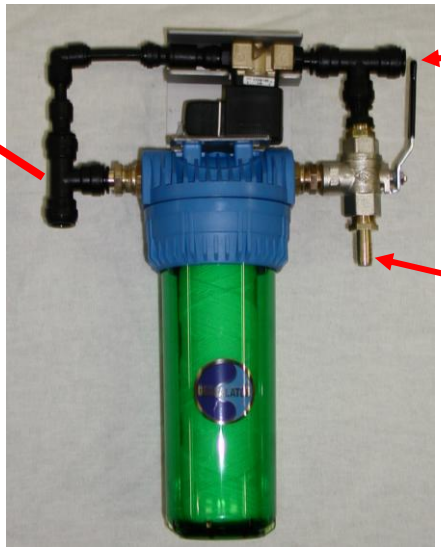
APPENDIX – A4

AUTOMATIC RINSING

Valve handle to the top:
Manual rinsing and
sterilisation

To the HP pump

Fresh water inlet

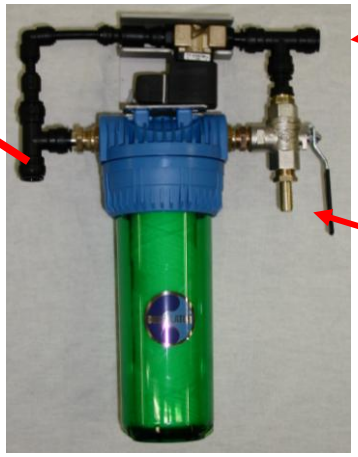


Sea water inlet

Valve handle to the bottom:
Normal position to pump
sea water

Fresh water inlet

To the HP pump



Sea water inlet

APPENDIX – A5

Troubleshooting

PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 12 wrench.
No pressure reading	Insufficient water	Open the hull valve and / or the rinsing valve
	Dirty pump valves	Dismantle and clean the pump head
Pulsing	- Slack belt	- Tighten the belt
	- Anti pulsing	- Replace anti pulsing system
Noisy HP pump.	- reduced water inlet or air inlet in the system. - Leak on pump head seals.	- Ensure correct size of hoses (diameter), clips and filters secure and filters clean.
Oil leak on HP pump	Worn seals on connecting rods	- Replace the seals.
Oil leak on crankshaft	Worn crankshaft seals	- Replace the 4 seals of crankcase
Oil leak on flange, on oil indicator side	- Seals wrongly positioned or crushed	- Replace seals
Slack Crankshaft belt	- Wear caused by belt too tight	- Replace bearings and tighten the belt
Plunger seals frequently need replacing	- Worn plungers - Poor water inlet	- Replace plungers - Check filtering
Insufficient water flow	- Very cold water	- Replace the pre filter
	- Dirty pre filter	
	- Power supply too weak	- Recharge batteries
	- Tension drop on the power cable	- Insufficient cable section, reinforce cable section.